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Notes on a sinuous till-cored ridge, south-east of Schefferville

***Photo* 1** *Photograph illustrating sinuous till-cored ridge. Arrow indicates location of pit 27.*

Introduction

While carrying out studies 40 miles south-east of Schefferville, Québec, a curious till-cored sinuous ridge of glacial origin was encountered about one-half mile east of the southermost part of Shoal Lake, Labrador (lat. 54°15′N, long. 66° 6,5′ W). The feature has been described elsewhere by the author (Cowan 1966, 1967) in conjunction with some other minor till-cored features which were called till-cored esker-like ridges. It is now felt that the features are dissimilar (the others being minor flutings of the ground moraine) and that the present feature should be called something other than esker-like, although it was first mapped as an esker by the Iron Ore Company of Canada. Although scarcely more than a sinuous tonal feature on 1:35 000 scale air photos, it would probably be mapped as an esker without groundknowledge.

The ridge was highly sinuous, 8 to 10 feet high, and had a symmetrical profile with both slopes about 15 degrees. The ridge was followed throughout its sinuous course (about one mile with an overall northwest-southeast trend) and towards its northernmost end the numbers and sizes of surficial glacial erratics increased considerably (the largest being about 10 feet in its greatest diameter). These erratics reflected the local bedrock with a volcanic conglomerate being the most prominent; the increase in size and frequency was attributed to an outcrop one half mile to the north.

Three pits were dug at a point where the ridge struck at 280 degrees. Pit 26 (Table 1) was dug on the flat ground moraine immediately northeast of the ridge, pit 23 on the southwest side of the ridge and about halfway up the side, and pit 27 was about halfway up the side of the northeast side of the ridge. The till was found to be similar to that found throughout the area and was a hard, grey, bouldery material which displayed a sub-horizontal fissile structure. The percentage of fines (less than 0,07 mm or No. 200 Tyler standard sieve) was about 25 percent, which is consistent with most of the till found in the area. Hardness or unconfined compressive strength of the till was found to be very stiff (Table 1) with little variation between the three sites The top 10-15 inches of till was usually weathered and was used for sampling or fabric analysis.

Pit 26, dug on the nearby flat surface, showed several interesting features. The usual weathered surface layer (about 14 inches thick) was underlain by 6 inches of very hard gravelly sand material which was distorted and discontinuous. This appeared to have been affected by an adjacent boulder which may have undergone some frost heaving, thereby causing contortions in the gravelly material. The boulder itself was surrounded by a layer of sand and silt containing a few pebbles, and this was all underlain by till of the type found throughout the area. Due to the small quantity of the gravelly sand, it is thought to have been frozen to the boulder and the layer of silty material at the time of emplacement.

Till Fabric Analysis

Dip and stike values for 50 pebbles in the ½–3-inch size range were obtained from each pit. Analysis of data follows the techniques developed by Andrews (1963), Andrews and Shimizu (1966) and Andrews and Smithson (1966). Two-dimensional analysis (Table 1) consisted of calculating a chi-square value indicating orientation strength or the degree by which the fabric differed from a uniform distribution, the arithmetic mean orientation and the standard deviation about this mean. Three-dimensional vectorial analysis was carried out after the data were rotated 90 degrees against the direction of final glaciation — in this case 330 degrees (see Andrews and Shimizu (1966) for details on the application of the method). The values shown in Table 1 for three-dimensional analysis consist of a vector strength R (maximum value of 50 in this case) which represents a measure of the degree by which the fabric differs from a random distribution, a mean orientation value, a value for the dip, and a circle of confidence which represents a measure of the dispersion about the resultant direction, i.e. the smaller the circle of confidence, the smaller the scatter of observations.

Results

At the point of observation the ridge struck at 280 degrees. Two dimensional analysis shows pits 23 and 26 to have significant orientation strengths while 27 does not. Pit 23 has an orientation mean of 355 (175) degrees, which is highly oblique or near normal to the long axis of the ridge, whereas pit 26 in the flat below the ridge is almost parallel to the ridge at this point. Vectorial analysis of the rotated data shows the vector strengths to be quite large and significant at the 99 percent level while radii of confidence are quite small. The orientation means in all cases indicate the fabrics resulted from forces having vector components both parallel to the direction of glaciation and normal to the ridge itself.

Interpretation

The sinuosity of the ridge suggests that the ridge is the result of infilling of a subglacial tunnel. The similarity to, and the lack of discontinuity from, the till comprising the surrounding ground moraine indicates that both the ridge and the ground moraine took on their final form at the same time. Finally, the till fabrics suggest a possible movement of materials towards the ridge. Consequently, the ridge is suggested to be the result of a squeezing of materials comprising the ground moraine into a subglacial tunnel.

The large number of erratic blocks found at the northernmost end of the ridge are thought to have been superimposed on the ridge but some consideration must be given to the possibility that a rock mass may have been a factor in determining the original location of the subglacial tunnel.

While only one occurrence of the feature does not permit many comparisons to be made, some mention might be made here of the « Till and Till-Cored Esker Ridges » described by Stalker (1960). Stalker's examples appear to have many similarities to the present feature although several of his ridges exhibited considerable reworking of the till by running water. His hypothesis (p. 36) states that the ridges were formed by the squeezing of a fluid basal till into subglacial meltwater tunnels.

Similarily, the feature described here is not unlike certain cross-valley moraines described by Andrews and Smithson (1966), where the mode of formation was suggested to be the squeezing of fluid till into basal crevasses or meltwater tunnels; specifically those oriented at right angles to the ice cliff. The notable differences in this case are firstly, that the ridge described here is a single occurrence whereas those of Andrews and Smithson occurred in numbers and secondly, that there is little to suggest the necessity of proglacial lakes in this instance whereas in the case of Andrews and Smithson it was necessary to relate the features to the presence of proglacial lakes. Nevertheless the mechanism as suggested by Andrews and Smithson could account for the feature described here as does that suggested by Stalker. The two modes of formation do not differ greatly when the idea of sub-glacial meltwater tunnels is used and this seems best to suit the sinuosity of the ridge.

***Table 1** Till fabric results. Significance levels are 95 percent* (*), *97.5 percent* (**) *and 99 percent* (***).

Sample number	23	26	27
Two dimensional analysis			
X^2 value	48,0	44,1	12,4
X^2 significance	***	***	N.S.
Mean orientation	355	289	221
Standard deviation	32	36	50
Three dimensional vectorial analysis			
Vector strength R	35,7	29,2	29,9
Significance R	***	***	***
Mean Orientation	155	167	168
Dip	6	2	2
Confidence Radius	12,9	17,3	16,8
Compressive Strength (tons per square inch)	3,29	2,82	2,96

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REFERENCES

ANDREWS, J. T., The cross-valley moraines of north-central Baffin Island: a quantitative analysis, *Geog. Bull.*, 1963, No. 20, pp. 82-129.

ANDREWS, J. T., and SHIMIZU, K., Three-dimensional vector technique for analysing till fabrics: discussion and Fortran program, *Geog. Bull.*, 1966, vol. 8, No. 2, pp. 151-165.

ANDREWS, J. T., and SMITHSON, B. B., Till fabrics of the cross-valley moraines of north-central Baffin Island, Northwest Territories, Canada, *Bull. Geog. Soc. Am.*, 1966, vol. 77, pp. 271-290.

COWAN, R., Preliminary report on geomorphological studies in the Shoal Lake area of west central Labrador, *McGill Sub-Arctic Research Paper*, 1966, No. 21, pp. 18-29.

COWAN, W. R., *The glacial geomorphology of the Shoal Lake area, Labrador*, Unpublished M.Sc. thesis, McGill University, Montréal, 1967, 127 pages.

STALKER, A. M., Ice-pressed drift forms and associated deposits in Alberta, *Ceol. Surv. Can. Bull.*, 1960, No. 57, 38 pages.